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X Rail Refrigeration Test with Florida Citrus,
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RAIL REFRIGERATION TEST WITH FLORIDA CITRUS

April 1951

Introduction

This report covers the second of a series of three rail transportation tests of Florida citrus fruits set up to compare refrigeration services throughout the 1950-51 shipping season. These tests were to cover each of the three phases of the shipping season, - cool winter months, the transitional period between winter and summer which occurs in early spring and late fall, and the period requiring maximum refrigeration during late spring and early summer. In addition, a comparison was desired of fruit temperatures at the top doorway position, with other parts of the load since many shipping tests were made as part of this study in which only top doorway temperatures were recorded. These comparisons will be discussed in the report covering the shipping tests. The first of this series of transportation tests was made during cool weather and is reported in H.T.&S. Office Report 277. The test covered by this report covers the transition period and was run April 5 to 9, 1951.

Twelve cars of oranges and grapefruit were included in this test which was a comparison of the free icing service available under Item 80, Section 2 and Standard Refrigeration and included fan vs. non-fan cars, room-precooled and car-precooled fruit vs. warm fruit loading, and different types of loading. A list of the test cars giving refrigeration service used, type of car, pre-cooling service, and load is presented in table 1. It had been planned to load warm fruit in cars A and B but it was inadvertantly room-precooled the night before loading, and as other fruit was not available, it was necessary to use it in the test cars.

This test was conducted during a period of fair, mild weather with outside air temperatures from 10 to 13 degrees below normal the day of loading. This departure from normal gradually lessened until about noon of the second day after loading, when normal temperatures were reached; thereafter, the temperatures rose gradually and were from 4 to 6 degrees above normal by the time the test cars were unloaded.

It was necessary to load the several cars under test at widely separated shipping points with the fruit from different sources, Polk, Orange, and Brevard Counties. The cars from the first two counties were loaded on the Atlantic Coast Line Railroad and assembled at Sanford while those loaded in Brevard County on the Florida East Coast Railroad made connection with the test train at Jacksonville. Therefore, in order to have comparable fruit for purposes of critical inspection at destination, a crate of oranges of a variety being shipped in quantity at that time and of identical origin and packinghouse treatment, was placed in the top quarterlength position in each car. The test lot selected for comparative evaluation at destination was U.S. No. 1 color-added Valencia oranges, size 200, picked, packed, and loaded at intervals of one day between each of these three latter operations.

The first inspection was made as soon as possible after each car was unloaded, which was about six to eight days after picking. The second and final inspection was made one week after the first.

The cars were all loaded on April 5 and moved over the Atlantic Coast Line, Richmond, Fredricksburg & Potomac, and Pennsylvania Railroads. Because of an accident on the main line on the Pennsylvania, the cars were delayed over 12 hours at Potomac Yards, and as a result there was a day's delay in unloading in most cases.

Results

Transit temperatures for each of the 12 test cars are given in tables 7 to 19 and are graphically presented in figures 2 to 8, except for the precooling data for car I which is given in table 15 and figure 6. A complete icing record for all cars is contained in tables 4 and 5. Table 6 shows a summary of rind breakdown and decay in the test boxes after arrival and upon holding for one week. In order to present a convenient comparison between the test cars, the average of all fruit temperatures in each car is presented in table 2. This table also includes the reduction in average temperature from loading to arrival at destination and the average transit temperature, while table 3 and figure 1 give a consolidated comparison of icing services and types of cars.

Item 80 vs. Standard Refrigeration. The average commodity temperatures of the four cars loaded with warm fruit and receiving Standard Refrigeration and of the six cars that were shipped under Item 80, Section 2 (one re-icing en route) are shown in table 3. It can be readily seen that there was practically no difference in transit fruit temperatures between these two services, the difference between the average temperatures upon arrival at destination being only 3.1 degrees. Maximum and minimum temperatures as shown in figure 1A were practically the same for these cars, which include both fan and non-fan types. Transit temperatures for cars with these two icing services but loaded with room-precooled fruit were also quite similar as shown in figure 2 for cars A and B.

Full Dunker vs. Half-stage Refrigeration. The use of half-stage, Standard Refrigeration was as effective as the more expensive full bunker icing as may be seen from a study of figures 3B, 4A, 4B, and 5B and also the data in table 2.

Pre-icing vs. Initial Icing after Loading. The fruit in car D (pre-iced) was loaded at 69.4°F. average temperature while that in car H (initially iced after loading) was 61.6°. With the extra cooling received between loading point and the first icing station, the fruit in car D was cooled down to 61° while that in car H, which moved under ventilation to its initial icing, had risen to 63.7°. However, from that point on, both cars, under Standard Refrigeration, cooled alike. See figures 3B and 5B and table 2. Cars C and G offer a comparison of cars iced before and after loading when receiving only one re-icing en route. Car C, iced before loading, had fruit temperatures averaging 69.4° at loading while car G's average was 66.9°.

Temperatures in both cars were reduced at about the same rate with little advantage in pre-icing shown in this instance. See figures 3A and 5A and table 2. In both comparisons cited above, the pre-iced cars melted more ice during the transit period, table 4.

Fan vs. Non-fan Cars. The temperature differences between the warmest and coolest parts of the loads during the transit period ranged from 13.4 to 21.9 degrees in the seven non-fan cars and from 2.7 to 7.9 degrees in the three fan cars. The average maximum and minimum temperatures in these cars is tabulated in table 3 and graphically represented in figure 1B. A comparison of top, middle and bottom temperatures in the individual test cars is shown in figures 4, 7, and 8. The most uniform temperatures found in any of the test cars were in the two fan cars loaded with room-precooled fruit, figure 2. Again considering the average maximum and minimum of the groups of fan and non-fan cars the average of all maximums of the non-fan cars for the harvest period was 62.0°F. while that of the fan cars was 57.7°. Greater cooling of the warm loads in transit was also accomplished by the fan cars. The average reduction in temperature in loads in these cars was 27.5 degrees while in the non-fan cars it was 22.8 degrees.

Room-precooled Fruit. As previously stated, cars A and B were to have been loaded with warm fruit but it was inadvertently placed in the precooling room over night. This resulted in average loading temperatures of 50°F. for car A and 44.5° for car B. Transit temperatures for both cars are shown in figure 2, and show very little cooling during the transit period as indicated by the relatively small quantity of ice melted (table 4). With 5,800 pounds of ice remaining in car A at destination it can be seen that precooled fruit may be safely shipped under Item 80, Section 2 rather than the expensive Standard Refrigeration.

Precooling in Car. Fruit temperatures in car I during the 6-hour precooling period are shown in figure 6. The average temperature was reduced only 5.4 degrees during this period and the temperature at the first station, Sanford, was only a degree or two lower than that in the other pre-iced cars loaded with warm fruit and not precooled by car fans prior to movement from the loading point. Temperatures in transit were reduced at approximately the same rate as in the balance of the test cars, table 2.

Type of Load. Crates vs. Bags over Crates. Car C, loaded with crates had an average fruit temperature of 69.4°F. at loading while car J, windowed kraft bags over one layer of crates, averaged 71.5°. Both cars were pre-iced and re-iced once in transit. As shown by table 2, both cars cooled about at the same rate in transit, with slightly more cooling in the load with crates alone, or 23.1 degrees as compared with 20.9 degrees. This greater cooling was accomplished by melting more ice, the total consumption for car C being 12,600 pounds and for car J 10,400 pounds. The icing records are contained in table 4.

Wirebound Crates in Standard Car vs. Kraft Bags in Double Deck Car.

Cars C and L respectively were loaded with warm fruit whose average temperatures were about the same, 69.4° F. and 68.0°. Cooling during the transit period was the same for both cars with a reduction in average temperature for both cars of approximately 23 degrees. While the fruit was cooled the same amount in both cars, the ice needed for car C was 12,600 pounds as compared with 8,000 pounds for car L, showing more efficient refrigeration in the double deck bag load.

Ice Meltage. A complete record of the ice used for all test cars is contained in tables 3 and 4. In the two cars of room-precooled fruit, car B (Standard Refrigeration) melted 7,600 pounds while car A (re-iced once) melted 7,800 pounds en route. Ice remaining at destination was 7,700 and 5,800 pounds respectively.

Car I, warm fruit precooled in car, melted 6,000 pounds during the pre-cooling period and up to the re-icing at Jacksonville. This was somewhat less than that in fan car K which received the same icing service as car I but no precooling. Total ice meltage for the precooled car was 12,700 pounds as compared with 14,200 for car K. The extra meltage in the latter was undoubtedly due to the very high fruit temperature, 83.6°, at loading.

In the 10 cars, C to L, loaded with warm fruit, the ice meltage ranged from 7,800 pounds in car G, loaded with 66.9° F. fruit and receiving one re-icing, to 15,700 pounds in car D loaded with 69.4° fruit and receiving Standard Refrigeration. In the four cars receiving Standard Refrigeration, table 5, ice meltage averaged 11,375 pounds, and 10,950 pounds in the six cars re-iced but once. This meltage resulted in an average temperature reduction of 23.3 degrees in the former cars and 24.8 degrees in the latter. Upon arrival at destination the Standard Refrigeration cars averaged 4,625 pounds of ice remaining in the bunkers while the cars re-iced but once averaged 4,350 pounds.

Ice meltage in the three fan cars during the transit period averaged 12,770 pounds, while in the seven non-fan cars it averaged 10,442 pounds. The average temperature reduction for the fan cars was 27.5 degrees as compared with 22.8 degrees for the non-fan cars.

Rind Breakdown and Decay. Valencia oranges in their prime condition were used as test fruit. This variety is less susceptible to pitting than is the Pineapple variety used in the November test, but more susceptible to aging or rind breakdown in the stem area. The Valencia orange in early April, the date of this test, is not as prone to stem-end rot as is the case later when it becomes ripier, but green mold rot is more prevalent during the cooler months than when the weather is warmer.

The test fruit was picked two days before loading in the cars and an interval ranging from four to six days with an average of 4.9 days transpiring between loading the cars and inspecting the test fruit soon after unloading. After the first inspection for rind breakdown and decay, the test packages were held for one week at room temperature until the second and final inspection was made. The results are given in table 6.

Rind Breakdown. The first inspection of the test packages showed that rind breakdown, mostly aging, ranged from 0 to 9.5 percent of the fruits affected for an average of 2.4 percent. No rind breakdown developed in three car lots, one of which was precooled in rooms. The greatest amount of rind breakdown was found in car J which had the highest average temperatures during the transit period. After holding these test lots for one week at room temperatures rind breakdown had increased appreciably and ranged from 2.5 to 17.5 percent with an average of 8.4 percent. The least amount of rind breakdown was in a room-precooled lot in car B, which also had less than the average amount at the first inspection, yet the other precooled lot, car A, which showed no rind breakdown at the first inspection, had the third highest amount of this disorder at the second inspection. The greatest amount of rind breakdown found at the second inspection was in the lot from car C which had less than the average amount at the first inspection.

Decay. At the first inspection, total decay, mostly green mold, ranged from 0 to 2.5 percent and was not consistent enough to be meaningful, as evidenced by the fact that no decay developed during the transit period in either the lot with the lowest or highest average temperature during transit, cars B and J respectively. A week later, decay had increased appreciably and ranged from 2.5 to 9.5 percent for an average of 7.4 percent. Then the least amount of decay, 2.5 percent, was in a non-precooled load in car D and the greatest amount of decay, 9.5 percent, was found in the room-precooled fruit, car A. Again the green mold fungus caused most of the decay, (almost five times as much as stem-end rot) and the decay-retarding properties of a deep precooling in rooms and low transit temperatures had been spent within a week after unloading.

DISCUSSION

While every prudent shipper is willing to invest in all the refrigeration or icing service necessary to protect the commodity during transit and deliver it in a sound condition, he can buy more refrigeration than is necessary. At the time of unloading, the bunkers are sometimes almost full of ice, and often, if not usually, they are unnecessarily full; this surplus or unmelted ice serves no useful purpose to the lading and is an economic waste to the shipper, and finally to the grower.

The principal demand on ice meltage takes place during the first two days of the transit period since rarely is a car of citrus held at destination more than a few days before unloading. While no great amount of ice need be maintained in the bunkers to hold fruit temperatures down after they are reduced to a safe level, the needed amount varies with the outside air temperature as well as the temperature of the commodity, but it is likely to be smaller than shippers generally assume to be necessary.

Precooled Fruit. The room-precooled fruit, cars A and B, (the former re-iced but once at Florence, S. C., during transit, the latter given Standard Refrigeration) arrived at destination with a pulp temperature that was lowered 10.2 degrees and 6.4 degrees respectively during the transit period. Even more significant from the viewpoint of cost is the fact that the car re-iced once had 5,800 pounds of ice in the bunkers on arrival,

enough to hold satisfactory temperature for several days without further re-icing. The refrigeration from the melting of ice served more to absorb the heat passing through the car walls than to further cool the loads of this room-precooled fruit.

The load precooled in a fan car and re-iced but once in transit, at Jacksonville, had a rather low commodity temperature, 69.4°F. at loading, hence the amount of heat removed during the loading and precooling period could not be expected to be great without the aid of salt. During the six-hour precooling period the average temperature of the fruit was reduced only 5.4 degrees. This car arrived at destination with an average commodity temperature of 44.3°, only 4.5 degrees warmer than the room-precooled fruit given the same icing service. Four days after loading or two and one half days after re-icing, 3,400 pounds of ice was in the bunkers, enough to hold safe temperatures two or three days.

The advantage previously found of precooling Valencia oranges in rooms in April over that of precooling in the car did not show up during this test.

The rate of cooling with ice and Preco fans is slower whenever the commodity temperature is below 70°F. as was the case with the lot of oranges precooled after loading. In this test the rate of cooling was so slow that the advantage of precooling in this manner may be open to question when the pick-up train comes along within 8 or 10 hours after the completion of loading of fan cars. An exception to this rule may be in the case of full-ripe fruit moving to market when green mold is rampant or when fruit is packed in such containers as kraft-lined crates or cartons, both of which tend to retard cooling.

Non-precooled Fruit. The commodity temperatures during the transit period of non-precooled fruit in the cars re-iced only once was so close to that of cars given Standard Refrigeration that there was no practical advantage of the more expensive service over the cheaper, Rule 25A, or free service (Item 80, Section 2).

The amount of ice remaining in the bunkers of the cars re-iced only once in transit, at Florence, ranged from 2,900 to 6,400 pounds on arrival at destination. This supply of ice was enough to hold from two to four days of fairly normal temperatures.

In the 10 lots that were warm when loaded the ice meltage served to cool the car structure as well as the lading. In these cars the temperature reduction of the commodity ranged from 1.65 degrees to 3.28 degrees, or an average of approximately 2.04 degrees per 1,000 pounds of ice melted. As a rule of thumb, the shipper may assume that the commodity cools at the rate of approximately 4 - 5 degrees per ton of ice melted when the time factor is only a few days.

Full Tank and Stage Icing Standard Refrigeration. The cost of stage icing is approximately 78 percent of full tank service. There was no significant difference in temperature reduction between full tank and stage icing Standard Refrigeration. On arrival at destination the stage-iced cars had 2,500 and 3,800 pounds of ice remaining, enough to hold safe temperatures two or three days in mild weather without re-icing. In the case of cars moving under Standard Refrigeration, the void, i.e., the space between the top of the bunker and the top of the ice, must be not more than 1/4 the capacity of the bunkers when the car is delivered. Thus, in the case of cars with bunker ice capacity of 9,600 pounds, the car given full tank service must be delivered with at least 7,200 pounds of ice, whereas the stage-iced car must have 3,600 pounds. While this difference may be of significance in hot weather if the car is to be held several days before re-icing or unloading, it would be most likely sound judgment for the shipper to use stage icing in lieu of full tank service when Standard Refrigeration is needed, and have such cars re-iced with a ton or two of ice after delivery if the need arises such as the case of the occasional car likely to be held several days before unloading.

Fan Cars vs. Non-fan Cars. There was no great difference in the average rate of commodity cooling between cars with and without fans, but the temperature spread between the warmest and coolest levels in the non-fan cars was considerably greater than that in the fan cars. The bottom layer in the non-fan cars became unnecessarily cold while the top layer did not cool as rapidly as is usually desirable. For example, during periods of decay, the greater amount of spoilage is generally found in the upper part of the load. The minimum temperatures in fan cars are likely to be higher and the maximum temperatures lower than in non-fan cars receiving the same icing service, thereby giving a more uniform temperature throughout the load in the fan car which in turn lessens the chances for decay to develop.

Comparison of Packages. In the case of room-precooled fruit one bunker full of ice (Rule 240) in fan cars may be a satisfactory substitute in spring for Rule 251 in non-fan cars with shipments made to markets reached within three or four days after loading.

Fruit in standard-nailed crates loaded according to the conventional "Largo" Plan, i.e., 7 rows on end without stripping, cooled at about the same rate as that in wirebound crates loaded in compliance with the conventional 7-row on side or bottom offset method. Likewise oranges in 8-pound windowed kraft bags loaded in double deck cars cooled about as rapidly as in crates in standard cars. Fruit in these small kraft bags over one layer of crates loaded in a standard non-fan car did not cool as rapidly as in kraft bags in double deck cars or in crates in standard cars. In another report^{1/} it is shown that fruit in mesh bags loaded in double deck cars, cooled somewhat faster than similar fruit in windowed kraft bags loaded in the same car. However, the time lag in rate of cooling in these small kraft bags was not great enough to be of practical significance most of the time.

^{1/} Report covering the shipping tests in preparation.

Rind Breakdown and Decay. This test was made before Valencia oranges normally become "weak" and susceptible to either rind breakdown or decay in severe proportions. There was no consistent correlation between temperatures in transit and the development of rind breakdown either during the transit period or during the week following unloading.

There was no clear-cut correlation between temperatures in transit and the development of decay either during or after the transit period in the test lots of Valencia oranges in prime condition. Apparently the transit period was too short for the range of temperatures encountered to have much effect on decay development. Most of the decay was caused by the green mold fungus.

SUMMARY

In April Standard Refrigeration proved to be but little if any more effective than Item 80, Section 2, or Rule 251, i.e., one re-icing, in cooling loads of warm citrus or in holding low temperatures in room-precooled fruit shipped to New York City.

The advantages of precooling of Valencia oranges quickly in rooms in early April over that of precooling them slowly with ice in fan-equipped cars did not show up in this test.

Stage icing Standard Refrigeration, which costs approximately 78 percent of that of full tank Standard Refrigeration, gave practically the same temperatures as did the full tank service.

On arrival at New York there was enough ice in the bunkers of cars loaded with warm fruit and given only one re-icing to maintain satisfactory temperature two or three days without further re-icing.

Fan cars produced a more uniform temperature throughout the load than did non-fan cars. The practical advantage of this more uniform temperature rests in a lower maximum temperature in the fan cars, hence, less likelihood of decay development. Fan cars can cool the load fast enough to greatly reduce if not eliminate the need for precooling before loading.

The method of loading did not greatly affect the commodity temperatures during transit.

Although the small individual kraft bag should be expected to retard cooling of its contents because of the insulating effect of the many layers of paper, the actual difference in commodity temperature between cars was not great enough to be harmful.

Neither rind breakdown or decay developed in commercial proportions during transit, although after arrival at destination both increased significantly. There was no clear-cut correlation between either rind breakdown or decay and temperatures in transit, loading or packaging methods. Most of the rind breakdown was classified as aging and most of the decay as green mold.

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TABLE NO. 1

Florida Citrus LIST OF TEST CARS Test 1 - April 1951

Car	Type	Loading period	Load	Refrigeration service
A FGE 57685	Standard fan car	1:00P to 3:45P	526 1-3/5 bu. wirebound crates	Pre-iced; fruit inadvertently precooled in the room, night before loading; item 80, section 2, re-iced at Florence, S. C.; vents closed to destination.
B FGE 56307	Standard fan car	1:00P to 3:45P	do	Pre-iced; fruit inadvertently precooled in the room, night before loading; standard refrigeration; vents closed to destination.
C FGE 59343	Standard non-fan car	8:30A to 10:00A	525 1-3/5 bu. wirebound crates	Same as car A, except the fruit was not precooled.
D FGE 57331	Standard non-fan car	10:00A to 3:30P	do	Same as car B, except the fruit was not precooled.
E FGE 59621	Standard fan car	5:45P to 7:00P	do	Pre-iced; stage icing, standard refrigeration; vents closed to destination.
F FGE 57271	Standard non-fan car	2:20P to 5:10P	do	do
G BRE 74802	Standard non-fan car	11:00A to 2:00P	493 1-3/5 bu. standard nail crates	Bunkers dry, vents opened from loading station to New Smyrna, Fla.; initially iced 9600 lbs.; item 80, section 2; re-iced at Florence, S. C.; vents closed from New Smyrna, Fla., to destination.

Table No. 1 (Continued)

Florida Citrus		List of Test Cars		Test 1 - April 1951	
Car	Type	Loading period	Load	Refrigeration service	
H WFE 67745	Standard non-fan car	4:30P to 6:30P	535 1-3/5 bu. standard nail crates	Same as car G, except it received standard refrigeration.	
I FGE 56279	Standard fan car	11:30A to 6:15P	210 4/5 bu. wire- bound crates and 423 1-3/5 bu. wirebound crates	Pre-iced, precooled in car, item 80, section 2; re-iced at Jacksonville, Fla.; vents closed to destination.	
J FGE 57116	Standard non-fan car	8:15A to 1:30P	4000 8 lb. Vent View Kraft bags over 105 1-3/5 bu. wirebound crates	Same as car A, except the fruit was not precooled.	
K FDE 9073	Double deck fan car	8:05A to 1:10P	4590 8 lb. Vent View Kraft bags	do	
L FDE 9343	Double deck non-fan car	1:15P to 5:50P	4950 8 lb. Vent View Kraft bags	do	

Florida Citrus

Test 1 - April 1951

Location	Precooled			Not precooled									
	In room			In car									
	A	B	I	J	C	D	E	F	G	H	K	L	
Car:	Fan	Fan	Fan	Fan	NF	NF	Fan	NF	NF	NF	Fan	NF	
Type:	80-2 3/	St.R. 4/	80-2 4/	NF 1/	80-2	St.R.	U/2 5/	U/2	80-2	St.R.	80-2	80-2	
Protective service:													
Date													
April													
Loading	500	445	694	715	694	694	670	718	669	616	836	680	
End of precooling	452	426	616 6/	589	600	610	662	614	609	637	634	576	
Sanford, Fla.	438	411	555	579	583	569	624	583	565	596	607	553	
New Smyrna, Fla.	437	404	513	575	569	548	586	548	549	573	580	539	
Savannah, Ga.	421	391	480	584	561	528	567	525	527	550	560	525	
Florence, S. C.	409	387	463	573	536	511	536	505	512	532	531	517	
Rocky Mount, N. C.	402	384	453	565	524	517	519	497	508	527	514	512	
Richmond, Va.	392	379	455	552	511	493	506	493	498	511	510	507	
Potomac Yards, Va.	395	382	428	530	488	461	473	458	486	484	497	481	
Potomac Yards, Va.	398	381	443	506	463	435	457	429	469	448	475	444	
New York City Area		389		513		415	454		457				
New York City Area						402							
New York City Area													
Temp. reduction 1/	102	64	251	209	231	259	213	289	200	168	361	236	
Average 8/	424	399	506	577	553	537	560	537	539	547	574	535	

1/ NF signifies a non-fan car.

2/DD signifies a double-deck car.

3/80-2 signifies Item 80, Section 2.

4/ St.R. signifies standard refrigeration.

U/2 signifies stage or upper half tank icing.

	1/	2/	3/	4/	5/	6/	7/	8/	9/	10/	11/	12/	13/	14/	15/	16/	17/	18/	19/	20/	21/	22/	23/	24/	25/	26/	27/	28/	29/	30/	31/	32/	33/	34/	35/	36/	37/	38/	39/	40/	41/	42/	43/	44/	45/	46/	47/	48/	49/	50/	51/	52/	53/	54/	55/	56/	57/	58/	59/	60/	61/	62/	63/	64/	65/	66/	67/	68/	69/	70/	71/	72/	73/	74/	75/	76/	77/	78/	79/	80/	81/	82/	83/	84/	85/	86/	87/	88/	89/	90/	91/	92/	93/	94/	95/	96/	97/	98/	99/	100/	101/	102/	103/	104/	105/	106/	107/	108/	109/	110/	111/	112/	113/	114/	115/	116/	117/	118/	119/	120/	121/	122/	123/	124/	125/	126/	127/	128/	129/	130/	131/	132/	133/	134/	135/	136/	137/	138/	139/	140/	141/	142/	143/	144/	145/	146/	147/	148/	149/	150/	151/	152/	153/	154/	155/	156/	157/	158/	159/	160/	161/	162/	163/	164/	165/	166/	167/	168/	169/	170/	171/	172/	173/	174/	175/	176/	177/	178/	179/	180/	181/	182/	183/	184/	185/	186/	187/	188/	189/	190/	191/	192/	193/	194/	195/	196/	197/	198/	199/	200/	201/	202/	203/	204/	205/	206/	207/	208/	209/	210/	211/	212/	213/	214/	215/	216/	217/	218/	219/	220/	221/	222/	223/	224/	225/	226/	227/	228/	229/	230/	231/	232/	233/	234/	235/	236/	237/	238/	239/	240/	241/	242/	243/	244/	245/	246/	247/	248/	249/	250/	251/	252/	253/	254/	255/	256/	257/	258/	259/	260/	261/	262/	263/	264/	265/	266/	267/	268/	269/	270/	271/	272/	273/	274/	275/	276/	277/	278/	279/	280/	281/	282/	283/	284/	285/	286/	287/	288/	289/	290/	291/	292/	293/	294/	295/	296/	297/	298/	299/	300/	301/	302/	303/	304/	305/	306/	307/	308/	309/	310/	311/	312/	313/	314/	315/	316/	317/	318/	319/	320/	321/	322/	323/	324/	325/	326/	327/	328/	329/	330/	331/	332/	333/	334/	335/	336/	337/	338/	339/	340/	341/	342/	343/	344/	345/	346/	347/	348/	349/	350/	351/	352/	353/	354/	355/	356/	357/	358/	359/	360/	361/	362/	363/	364/	365/	366/	367/	368/	369/	370/	371/	372/	373/	374/	375/	376/	377/	378/	379/	380/	381/	382/	383/	384/	385/	386/	387/	388/	389/	390/	391/	392/	393/	394/	395/	396/	397/	398/	399/	400/	401/	402/	403/	404/	405/	406/	407/	408/	409/	410/	411/	412/	413/	414/	415/	416/	417/	418/	419/	420/	421/	422/	423/	424/	425/	426/	427/	428/	429/	430/	431/	432/	433/	434/	435/	436/	437/	438/	439/	440/	441/	442/	443/	444/	445/	446/	447/	448/	449/	450/	451/	452/	453/	454/	455/	456/	457/	458/	459/	460/	461/	462/	463/	464/	465/	4
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7/ Temperature reduction from loading until arrival at Jersey City.
not included in average.

8/ Includes readings at Rocky Mount and Richmond, terminates with the first readings at the New York City area.

TABLE NO. 3

CONSOLIDATED FRUIT TEMPERATURES
COMPARISON OF ICING SERVICES AND OF TYPES OF CARS

Florida Citrus				Test 1 - April 1951											
Station	Date	Hour	Standard Refrigeration			Item 80, Sec. 2			Non-fan Service			Fan Service			
			Grand Average	Min.	Max.	Grand Average	Min.	Max.	Grand Average	Min.	Max.	Grand Average	Min.	Max.	
April	April		Average	4 cars	Average	Average	6 cars	Average	Average	7 cars	Average	Average	3 cars		
At loading	5		675	675	675	715	715	715	684	684	684	733	733	733	
New Smyrna or Sanford, Fla.	6	5:30A	634	551	698	597	514	651	607	506	675	623	580	659	
Jacksonville, Fla.	6	5:55P	593	496	666	574	484	639	575	445	664	595	561	626	
Savannah, Ga.	6	11:00P	564	473	634	554	470	618	557	447	640	560	528	589	
Florence, S. C.	7	6:15A	543	456	615	540	457	604	543	437	624	536	502	572	
Rocky Mount, N. C.	7	1:10P	521	435	592	522	446	587	527	424	608	510	483	546	
Richmond, Va.	7	4:50P	515	425	584	513	433	578	521	415	602	495	465	531	
Potomac Yards, Va.	7	10:10P	501	419	571	506	431	569	509	412	591	490	460	521	
Potomac Yards, Va.	7	12:00N	469	405	531	485	415	542	484	396	560	466	445	485	
Destination	9	10:35A	442	396	489	467	413	520	456	390	524	458	443	470	
Average temperature (11 readings)			548	474	610	549	478	605	548	456	620	550	522	577	
Reduction in temperature during transit			233	279	186	248	302	195	228	294	160	275	290	263	

Grand average from 9 positions each car.
 Average minimum from 3 positions on same level in each car.
 Average maximum from 3 positions on same level in each car.

ICING AND BUNKER INSPECTION RECORD

Test 1 - April 1951

Florida Citrus

CAR, TYPE AND TREATMENT

LOCATION	HOUR	DATE	A		B		C		D		E		F	
			Fans "on"	Full Bunker	Fans "on"	Full Bunker	Non-fan	Full Bunker	Non-fan	Full Bunker	Fans "on"	Upper Stage	Non-fan	Upper Stage
			Pounds		Pounds		Pounds		Pounds		Pounds		Pounds	
Pre-iced at Sanford	4:15P	April 4	9,600		9,600		9,600		9,600		4,800		4,800	
Initially iced at New Smyrna 1/	6:15A	6	-----		-----		-----		-----		-----		-----	
Re-iced at Sanford	6-7 A	6	-----		1,400		-----		5,500		2,800		3,400	
Re-iced at Jacksonville	2:25P	6	-----		-----		-----		-----		-----		-----	
Re-iced at Florence	7:33A	7	4,000		2,300		6,800		4,600		4,200		2,600	
Ice remaining at Potomac Yards		7	7,200		7,700		7,200		6,700		2,000		3,000	
Re-iced at Potomac Yards	11-12P	7	-----		2,000		-----		2,400		2,100		1,800	
Total ice supplied to destination			13,600		15,300		16,400		22,100		13,900		12,600	
Ice remaining on arrival at destination		9	5,800		-----		3,800		6,400		2,500		3,800	
		10	-----		7,700		-----		-----		-----		-----	
		11	-----		-----		-----		-----		-----		-----	
Ice melted to destination			7,800		7,600		12,600		15,700		11,400		8,800	
Ice supplied at destination	3:15A	9	-----		-----		-----		-----		-----		2,500	
	11:15A	9	-----		-----		-----		3,000		1,800		-----	
Ice remaining at unloading		9	5,800		-----		3,400		-----		-----		-----	
		10	-----		7,000		-----		-----		4,000		2,800	
		11	-----		-----		-----		7,200		-----		-----	

1/ After loading or "under load".

Table No. 4 (continued)

ICING AND BUNKER INSPECTION RECORD

Test 1 - April 1951
Florida Citrus

LOCATION	HOUR	DATE	CAR, TYPE, AND TREATMENT											
			G		H		I		J		K		L	
			Non-fan	Pounds	Non-fan	Pounds	Non-fan	Pounds	Non-fan	Pounds	Fans "on"	Pounds	Non-fan	Pounds
			Full Bunker		Full Bunker		Full Bunker		Full Bunker		Full Bunker		Full Bunker	
Pre-iced at Sanford	4:15P	April 4												
Initially iced at New Smyrna I/	6:15A	6	9,600		9,600									
Re-iced at Sanford	6-7A	6												
Re-iced at Jacksonville	2:25P	6						6,000						
Re-iced at Florence	7:33A	7	3,000		3,400					5,600	8,000	4,800		
Ice remaining at Potomac Yards		7	6,700		7,700			4,300		8,200	5,800	7,700		
Re-iced at Potomac Yards	11-12P	7			2,400									
Total ice supplied to destination			12,600		15,400			15,600		15,200	17,600	14,400		
Ice remaining on arrival at destination		9						2,900		4,800	3,400	6,400		
		10	4,800		5,800									
		11												
Ice melted to destination			7,800		9,600			12,700		10,400	14,200	8,000		
Ice supplied at destination	3:15A	9												
	11:15A	9												
Ice remaining at unloading		9						2,900		4,800	3,400	6,400		
		10	4,800		5,800									
		11												
1/ After loading or "under load."														

SUMMARY TABLE 5

ICE MELTAGE IN RELATION TO TEMPERATURE REDUCTION DURING TRANSIT COMPARISON OF ICING SERVICES AND TYPES OF CARS

Florida Citrus	COMPARISON OF ICING SERVICES		COMPARISON OF CAR TYPES		Test 1, April 1951
	Standard refrigeration 4 cars <u>1/</u>	Item 80, section 2 6 cars	Fan service 3 cars <u>2/</u>	Non-fan service 7 cars <u>2/</u>	
Pounds					
Ice supplied	16,000	15,300	15,700	15,528	
Ice remaining at Jersey City	4,625	4,350	2,930	5,086	
Ice melted to Jersey City	11,375	10,950	12,770	10,442	
Total heat removed to Jersey City	23.3°	24.8°	27.5°	22.8°	
Average transit temperature of commodity	54.8°	54.9°	55.0°	54.8°	

1/ Includes two cars given stage icing

2/ Includes one car given stage icing

DEVELOPMENT OF RIND BREAKDOWN AND DECAY IN

U.S. NO. 1 COLOR ADDED VALENCIA ORANGES, SIZE 200

Test 1 - April 1951

Florida Citrus

CAR	Time Interval 1/ Days	First Inspection		+ 1 week at room temperatures			
		Total DK	SER	GM	RB 2/ Total DK 3/ Percent	RB 2/ Total DK 3/ Percent	SER 3/ GM 3/ Percent
A x	5	1.0	0	1.0	13.6	9.5	4.0
B x	4	0	0	0	2.5	8.0	0
C	6	1.0	0.5	0.5	17.5	5.5	0.5
D	4	0	0	0	3.5	2.5	0
E	4	1.5	0	1.5	11.4	8.4 4/	1.5
F	0	0	0	0	14.4	5.2	0.5
G	0.5	2.0	0	2.0	7.5	8.0	0
H	4	0.5 4/	0	0	4.5	9.0 4/	3.0
I xx	6	1.0	0.5	0.5	5.0	8.5	3.5
J	5	0	0	0	10.5	7.5	0
K	6	2.0 4/	0	1.0	5.0	8.0 4/	1.0
L	6	2.5 4/	0	1.5	5.0	8.5 4/	1.0
Range	-	0-2.5	---	---	2.5-17.5	2.5-9.5	---
Average	4.9	1.0	0.1	0.7	8.4	7.4	1.3

1/ Time from loading date to first inspection at destination.

2/ Includes aging and pitting of commercial importance.

3/ Cumulatively.

4/ Oospora rot responsible for part of this total.

x signifies a room precooled load.

xx signifies a load precooled in car.

RB signifies Rind Breakdown.

DK signifies Decay.

SER signifies Stem-end rot.

GM signifies Green Mold.

Table 1

TEMPERATURES IN TRANSIT

April, 1951-A

Oranges

FGE 57685, Fans On

Billing Weight - 48918

Priced, Item 80, Section 2; Precooled in room; Reiced Florence

Place	Date	Time	OST	Top Air	Bot Air	BB	BQ	BD	MB	MQ	MD	TB	TQ	TD	TXQ	Bot Avg	Mid Avg	Top Avg	Grand Avg
Priced at Sanford, April 4 at 4:15 P.M.																			
Isleworth, Fla.	5	3:45P	73	-	-	-	-	-	N O	R E C O R D	-	-	-	-	-	-	-	-	-
Sanford, Fla.	6	5:30A	50	477	342	376	436	467	411	502	482	462	467	467	457	426	465	465	452
Jacksonville, Fla.	6	12:40P	67	432	352	406	456	467	406	492	457	427	427	407	442	443	452	420	438
Jacksonville, Fla.	6	5:55P	65	472	342	406	456	467	411	492	462	437	437	422	447	443	455	432	443
Savannah, Ga.	6	11:00P	59	427	362	421	461	462	411	482	447	427	417	402	432	448	447	415	437
Florence, S. C.	7	6:15A	50	407	352	426	446	447	396	462	422	407	397	382	407	440	427	395	421
Reiced at Florence																			
Rocky Mount, N. C.	7	1:10P	75	392	352	426	436	437	396	442	407	392	377	372	392	433	415	380	409
Richmond, Va.	7	4:50P	75	407	347	426	426	427	386	432	397	382	372	367	382	426	405	374	402
Potomac Yards, Va.	7	10:10P	56	397	342	416	406	417	376	422	382	377	367	362	377	413	393	369	392
Potomac Yards, Va.	8	12:00N	59	417	337	371	406	412	376	437	397	397	382	377	382	396	403	385	395
Pier 29, New York City	9	2:25A	51	407	352	406	416	417	386	422	392	397	377	372	387	413	400	382	398

Note:

OST - outside temperature

BB - bottom bunker

CL - centerline

BQ - bottom quarterlength

BD - bottom door

MB - middle bunker

MQ - middle quarterlength

MD - middle doorway

TB - top bunker

TQ - top quarterlength

TD - top door

TXQ - center fruit of top quarterlength, not included in averages

Table 8

TEMPERATURES IN TRANSIT

April, 1951-B
Oranges
Billing Weight - 48918

CAR B

FGE 56307, Fans On

526 boxes

Preiced; standard refrigeration. Precooled in room.

Place	Date	Time	OST	Air	Top	Bot	BB	BQ	BD	MB	MQ	MD	TB	TQ	TD	TXQ	Bot	Mid	Top
				Air												CL	Avg	Avg	Avg
Preiced at Sanford, April 4 at 4:15 P.M.																			
Isleworth, Fla.	5	3:45P	73	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sanford, Fla.	6	5:30A	50	424	336	360	415	436	467	446	410	435	439	426	449	404	441	433	426
Reiced at Sanford																			
Jacksonville, Fla.	6	12:40P	67	394	346	390	420	426	432	421	410	420	389	391	414	412	421	400	411
Jacksonville, Fla.	6	5:55P	65	429	336	395	415	416	432	431	410	415	404	401	429	409	424	407	413
Savannah, Ga.	6	11:00P	59	379	351	400	420	416	412	411	410	405	384	381	399	412	411	390	404
Florence, S. C.	7	6:15A	50	359	346	405	415	406	392	391	400	385	364	361	369	409	394	370	391
Reiced at Florence																			
Rocky Mount, N. C.	7	1:10P	75	369	351	405	405	396	387	371	395	390	364	366	369	402	384	373	387
Richmond, Va.	7	4:50P	75	384	356	405	395	396	382	371	390	380	364	371	369	399	381	372	384
Potomac Yards, Va.	7	10:10P	56	379	346	395	385	386	382	361	390	375	364	371	369	389	378	370	379
Potomac Yards, Va.	8	12:00N	59	389	336	365	380	396	387	376	390	375	384	381	379	380	384	380	382
Reiced at Potomac Yards																			
Jersey City, N. J.	9	10:35A	62	389	341	370	375	396	387	386	390	375	374	376	374	380	388	375	381
Jersey City, N. J.	10	10:30A	65	409	346	355	375	396	392	381	400	395	404	401	399	375	391	400	389

Table 9

TEMPERATURES IN TRANSIT

April, 1951-C
Oranges
Billing Weight - 48825

CAR C

FGE 59343, Non-fan Car

525 boxes

Preiced, Item 80, Section 2; reiced Florence.

Place	Date	Top Air	Bot Air	BB	BQ	BD	MB	MQ	MD	TB	TQ	TD	TXQ	Bot	Mid	Top
	April	Time	OST	Air	CL	CL	CL	CL	CL	CL	CL	CL	CL	AVG	AVG	AVG
Preiced at Sanford, April 4, at 4:15 P.M.																
Lucerne Park, Fla.	5	10:30A	65	705	375	650	670	665	720	754	737	715	754	662	731	735
Lucerne Park, Fla.	5	3:30P	78	725	385	510	530	535	680	734	707	715	734	525	708	719
Sanford, Fla.	6	5:30A	50	690	395	415	465	445	640	664	692	700	704	442	660	699
Jacksonville, Fla.	6	12:40P	67	675	375	400	450	435	620	644	677	685	689	428	638	684
Jacksonville, Fla.	6	5:55P	65	675	370	395	460	440	610	624	667	675	674	432	621	672
Savannah, Ga.	6	11:00P	59	665	365	390	455	435	600	614	662	670	674	427	611	669
Florence, S. C.	7	6:15A	50	655	365	390	450	435	590	594	657	665	664	425	595	662
Reiced at Florence																
Rocky Mount, N. C.	7	1:10P	75	630	345	380	430	415	555	564	627	640	639	408	563	635
Richmond, Va.	7	4:50P	75	635	355	370	420	410	540	549	612	630	629	400	550	624
Potomac Yards, Va.	7	10:10P	56	625	345	360	420	405	520	524	597	615	614	395	528	609
Potomac Yards, Va.	8	12:00N	59	580	350	365	410	390	485	499	572	585	584	388	495	580
Jersey City, N. J.	9	11:25A	62	550	345	365	410	390	455	464	537	545	539	388	461	540
									465				560			463

Table 10

TEMPERATURES IN TRANSIT

CAR D

FGE 57331, Non-fan Car

April, 1951-D
Oranges
Billing Weight - 48825

Preiced; standard refrigeration.

Place	Date	Time	OST	Top Air	Bot Air	BB	BQ	BD	MB	MQ	MD	TB	TQ	TD	TXQ	Bot Avg	Mid Avg	Top Grand
Preiced at Sanford, April 4 at 4:15 P.M.																		
Incerne Park, Fla.	5	3:30P	78	718	400	546	608	720	--	758	744	705	740	742	784	625	751	729
Sanford, Fla.	6	5:30A	50	698	400	431	488	470	--	703	--	695	715	767	769	463	703	726
Reiced at Sanford																		
Jacksonville, Fla.	6	12:40P	67	663	355	386	458	425	--	663	--	670	690	692	739	423	663	684
Jacksonville, Fla.	6	5:55P	65	648	360	381	448	415	--	638	--	650	680	677	724	415	638	669
Savannah, Ga.	6	11:00P	59	638	360	376	473	410	--	618	--	635	660	662	714	420	618	652
Florence, S. C.	7	6:15A	50	618	350	366	448	400	--	588	--	615	640	642	694	405	588	632
Reiced at Florence																		
Rocky Mount, N. C.	7	1:10P	75	598	340	366	408	390	--	568	--	600	620	622	674	388	568	614
Richmond, Va.	7	4:50P	75	598	335	356	--	390	--	548	--	590	610	607	664	373	548	602
Potomac Yards, Va.	7	10:10P	56	588	330	346	438	380	--	528	--	575	590	592	654	388	528	586
Potomac Yards, Va.	8	12:00N	59	538	335	346	398	375	--	488	434	545	555	547	--	373	461	549
Reiced at Potomac Yards																		
Jersey City, N. J.	9	11:30A	62	508	335	346	368	370	--	458	434	490	510	507	669	361	446	502
Reiced at Jersey City																		
Jersey City, N. J.	10	11:45A	70	488	330	336	368	360	--	438	414	455	480	472	634	355	426	469
Jersey City, N. J.	11	1:30P	55	468	330	346	358	360	--	418	394	435	450	452	614	355	406	446

Table 11

TEMPERATURES IN TRANSIT

CAR E

FGE 59621, Fans On

April, 1951-E
Oranges and Grapefruit
Billing Weight - 48220

525 boxes

Preiced; half stage; standard refrigeration.

Place	Date	Time	OST	Top Air	Bot Air	BB	BQ	BD	MB	MQ	MD	TB	TQ	TD	TXQ	Bot	Mid	Top
	April			Air	Air	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	AVG	AVG	AVG
Preiced at Sanford, April 4 at 4:15 P.M.																		
Winter Haven, Fla.	5	7:00P	66	695	415	670	675	720	735	730	795	670	776	770	800	688	753	739
Sanford, Fla.	6	5:30A	50	615	420	620	645	640	680	700	705	640	---	665	765	635	695	653
Reiced at Sanford																		
Jacksonville, Fla.	6	12:40P	67	555	390	560	640	615	630	655	640	590	726	560	700	605	642	625
Jacksonville, Fla.	6	5:55P	65	605	390	530	595	580	610	650	635	580	626	575	670	568	632	594
Savannah, Ga.	6	11:00P	59	540	430	580	610	580	580	630	605	570	596	525	---	590	605	564
Florence, S. C.	7	6:15A	50	555	455	550	605	560	555	650	585	520	556	520	---	572	597	532
Reiced at Florence																		
Rocky Mount, N. C.	7	1:10P	75	505	395	580	580	530	535	575	520	480	556	465	650	563	543	500
Richmond, Va.	7	4:50P	75	520	390	575	565	510	520	530	495	470	551	455	605	550	515	492
Potomac Yards, Va.	7	10:10P	56	525	375	580	545	490	495	530	505	460	496	450	620	538	510	469
Potomac Yards, Va.	8	12:00N	59	505	350	---	490	460	485	---	475	---	---	455	620	475	480	455
Reiced at Potomac Yards																		
Jersey City, N. J.	9	11:35A	62	505	340	---	475	445	455	---	450	440	501	430	---	460	453	457
Reiced at Jersey City																		
Jersey City, N. J.	10	11:45A	70	535	355	440	445	420	445	---	455	---	526	450	---	435	450	488

TEMPERATURES IN TRANSIT
CAR F

525 boxes

FGE 57271, Non-fan Car

[illegible]

TEMPERATURES IN TRANSIT

BRM 74802, Non-Tax Car

April, 1951-G
Grapefruit
Billing Weight - 44863

Bunkers dry, Item 80, Section 2. Initially iced New Smyrna; reiced Florence.

Date	Place	Time	OST	Top Air	Bot Air	BB	BQ	BD	MB	MQ	MD	TB	TQ	TD	TXQ	Bot Avg	Mid Avg	Top Avg	Grand Avg
5	Jay Jay, Fla.	2:00P	71	664	610	600	560	600	589	574	610	590	599	601	594	587	591	597	591
6	New Smyrna, Fla.	4:50A	46	614	550	600	590	600	609	594	610	620	629	631	624	597	604	627	609
Initially iced at New Smyrna																			
6	Jacksonville, Fla.	5:55P	65	604	350	480	500	530	584	584	575	600	614	616	614	503	581	610	565
6	Savannah, Ga.	11:00P	59	594	350	450	480	505	569	564	560	590	609	611	604	478	564	603	549
7	Florence, S. C.	6:15A	50	574	350	420	450	470	549	554	540	570	599	591	594	447	548	587	527
Reiced at Florence																			
7	Rocky Mount, N. C.	1:10P	75	579	340	400	440	455	529	539	520	565	579	581	579	432	529	575	512
7	Richmond, Va.	4:50P	75	589	340	400	430	450	524	534	515	560	579	581	574	427	524	573	502
7	Potomac Yards, Va.	10:10P	56	574	330	390	420	440	499	524	500	560	569	581	564	417	508	570	498
8	Potomac Yards, Va.	12:00M	59	544	345	375	410	---	479	499	480	540	554	551	549	393	486	548	486
9	Jersey City, N. J.	10:30A	62	574	350	380	415	415	459	484	465	535	534	531	534	403	469	533	469
10	Jersey City, N. J.	10:30A	65	524	350	380	400	410	449	464	450	520	519	521	524	397	454	520	457

Table 14

TEMPERATURES IN TRANSIT

CAR H

535 boxes

WFE 67745, Non-fan Car

April, 1951-H
Grapefruit
Billing Weight = 48685

Bunkers dry; standard refrigeration; initially iced New Smyrna.

Place	Date	Time	OST	Top Air	Bot Air	BB	BQ	BD	MB	MQ	MD	TB	TQ	TD	TXQ	Bot Ave	Mid Ave	Top Grand Ave
Jay Jay, Fla.	5	6:30P	65	661	412	632	652	653	672	662	642	683	662	662	633	646	659	669
New Smyrna, Fla.	6	4:50A	46	661	432	575	612	613	652	662	642	663	662	652	653	600	652	659
Initially iced at New Smyrna																		
Jacksonville, Fla.	6	5:55P	65	641	362	472	512	538	622	632	627	643	662	652	653	507	627	652
Savannah, Ga.	6	11:00P	59	621	362	432	482	503	597	612	602	633	652	642	643	472	604	642
Florence, S. C.	7	6:15A	50	611	352	402	462	473	562	592	582	613	632	632	623	446	579	626
Reiced at Florence																		
Rocky Mount, N. C.	7	1:10P	75	601	342	392	442	458	542	567	557	593	617	617	608	431	555	609
Richmond, Va.	7	4:50P	75	606	347	387	437	453	532	562	547	593	617	617	608	435	547	609
Potomac Yards, Va.	7	10:10P	56	591	342	372	422	433	512	542	532	583	602	602	593	409	529	596
Potomac Yards, Va.	8	1:30P	59	551	342	367	407	413	472	502	487	553	577	577	568	396	487	569
Reiced at Potomac Yards																		
Jersey City, N. J.	10	10:30A	65	511	342	362	392	403	422	452	452	503	522	522	503	386	442	516
																448		

Table 15

210 4/5 bushel boxes and
423 1 3/5 bushel boxes

TEMPERATURES IN TRANSIT

CAR I

FGE 56279, Fans On

April, 1951-I
Oranges and Temples
Billing Weight - 48999

Preiced, Item 80, Section 2; reiced Jacksonville.

Place	Date	Top Air	Bot Air	BB	BQ	BD	MB	MQ	MD	TB	TQ	TD	TXQ	Bot Avg	Mid Avg	Top Grand Avg
	April	OST		CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL
Winter Garden, Fla.	5	6:15P	71	735	395	505	660	685	630	725	712	680	730	617	689	703 670
Winter Garden, Fla.	6	12:25A	54	495	635	600	680	655	620	685	602	640	600	645	636	567 616
Sanford, Fla.	6	5:30A	50	560	385	525	620	595	595	---	587	615	590	580	591	557 574
Jacksonville, Fla.	6	12:40P	67	520	415	525	610	580	570	---	567	580	550	572	569	528 555
Jacksonville, Fla.	6	5:55P	65	545	365	455	560	545	560	---	582	580	560	520	571	540 540
Savannah, Ga.	6	11:00P	59	455	385	495	570	535	520	---	532	530	510	533	526	483 513
Florence, S. C.	7	6:15A	50	435	385	495	550	505	480	---	482	480	460	517	481	443 480
Rocky Mount, N. C.	7	1:10P	75	435	405	465	530	485	450	495	452	460	430	493	466	430 463
Richmond, Va.	7	4:50P	75	450	385	470	510	475	445	445	442	450	425	485	444	430 453
Potomac Yards, Va.	7	10:10P	56	455	400	460	500	475	450	---	447	450	435	478	449	435 455
Potomac Yards, Va.	8	12:00N	59	445	380	375	445	430	440	---	447	435	435	417	444	430 428
Pier 29, New York City	9	2:25A	51	435	425	425	460	445	440	---	442	440	430	443	441	433 443

Preiced at Sanford, April 4 at 4:15 P.M.

Precooled 6 hours in car

Reiced at Jacksonville

Table 16

4000 8-lb. vent view paper bags
Over 105 boxes

TEMPERATURES IN TRANSIT

CAR J

FGE 57116, Non-fan Car

April, 1951-J
Oranges and Grapefruit
Billing Weight - 43515

Preiced, Item 80, Section 2; reiced Florence.

Place	Date	Time	OST	Top Air	Bot Air	BB	BQ	BD	MB	MQ	MD	TB	TQ	TD	XQ	Bot AVE	Mid AVE	Top Grand AVE
Preiced at Sanford, April 4 at 4:15 P.M.																		
Winter Garden, Fla.	5	2:00P	78	720	365	512	537	571	707	723	677	715	712	660	660	540	702	696
Winter Garden, Fla.	5	6:25P	67	710	365	472	497	521	667	703	657	695	702	660	660	497	676	686
Sanford, Fla.	6	5:30A	50	670	355	427	462	471	627	663	637	675	687	650	698	453	642	671
Jacksonville, Fla.	6	12:40P	67	660	345	422	457	461	607	643	627	665	682	650	683	447	626	666
Jacksonville, Fla.	6	5:55P	65	660	355	432	487	461	597	643	627	665	682	650	683	460	622	666
Savannah, Ga.	6	11:00P	59	660	355	422	487	451	577	623	617	665	682	650	673	453	606	666
Florence, S. C.	7	6:15A	50	620	345	---	487	451	577	603	597	645	672	640	653	469	592	652
Reiced at Florence																		
Rocky Mount, N. C.	7	1:10P	75	630	335	---	467	441	567	593	587	635	662	630	653	454	582	642
Richmond, Va.	7	4:50P	75	630	335	---	467	441	547	583	577	615	662	630	643	454	569	636
Potomac Yards, Va.	7	10:10P	56	625	345	---	462	436	532	563	557	600	652	615	633	449	551	622
Potomac Yards, Va.	8	12:00N	59	585	340	---	442	421	502	543	537	575	622	595	603	432	527	597
Sunnyside, N. J.	9	12:30P	64	560	330	---	457	406	472	498	512	545	597	560	---	432	494	567
Garden City, N. Y.	9	9:30P	58	590	345	---	457	411	477	493	507	565	612	580	583	434	492	586
																		513

Note:

XQ - half way between top and bottom of bag portion of load, not included in averages

Table 17

TEMPERATURES IN TRANSIT

CAR K 1/

4590 8-lb. vent view paper bags

FDE 9073, Fans On

April, 1951-K
Oranges
Billing Weight - 39933

Priced, Rule 251; reiced Florence.

Place	Date	Time	OST	Top Air	Bot Air	BB	BQ	BD	MB	MQ	MD	TB	TQ	TD	XQ	Bot Avg	Mid Avg	Top Grand Avg
Priced at Sanford, April 4 at 4:15 P.M.																		
Haines City, Fla.	5	2:10P	74	726	356	653	651	768	766	706	791	694	705	708	699	691	754	702
Haines City, Fla.	5	7:10P	70	731	366	588	591	693	741	696	761	709	710	713	694	624	733	711
Sanford, Fla.	6	6:45A	50	676	356	498	541	608	696	666	711	674	670	643	674	549	691	662
Jacksonville, Fla.	6	12:40P	67	606	366	488	571	588	656	646	691	629	620	578	654	549	664	609
Jacksonville, Fla.	6	5:55P	65	636	356	468	531	588	656	646	661	629	630	608	644	529	654	622
Savannah, Ga.	6	11:00P	59	566	376	458	571	578	606	626	651	599	590	538	624	536	628	576
Florence, S. C.	7	6:15A	50	546	366	458	571	568	576	606	621	559	560	518	594	532	601	546
Reiced at Florence																		
Rocky Mount, N. C.	7	1:10P	75	466	346	458	561	538	536	596	611	519	510	448	564	519	581	492
Richmond, Va.	7	4:50P	75	476	336	448	561	528	506	576	591	489	490	438	---	512	558	472
Potomac Yards, Va.	7	10:10P	56	496	341	443	551	523	506	566	571	489	490	453	539	506	548	477
Potomac Yards, Va.	8	12:00N	59	501	331	408	481	503	506	546	541	499	510	478	529	464	531	496
Sunnyside, N. J.	9	12:50P	64	486	336	398	451	478	481	521	516	474	490	463	509	442	506	476

1/ Fan in A end failed to operate.

Table 18

4950 8-lb. vent view paper bags

TEMPERATURES IN TRANSIT

FDE 9343, Non-fan Car

CAR L

April, 1951-L
Oranges
Billing Weight.- 43065

Preiced, Rule 251; reiced Florence

Place	Date	Time	OST	Air	Top	Bot	BB	CL	BB	BQ	BD	MB	MQ	MD	TB	TQ	TD	XQ	Bot	Mid	Top	Grand
	April			Air	Air	Air	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	AVG	AVG	AVG	AVG
Preiced at Sanford, April 4 at 4:15 P.M.																						
Haines City, Fla.	5	7:10P	70	642	352	567	557	627	627	681	642	641	657	646	---	584	650	648	627			
Sanford, Fla.	6	6:45A	50	602	347	457	457	542	572	641	627	641	637	606	642	485	613	628	576			
Jacksonville, Fla.	6	12:40P	67	597	347	437	447	517	557	626	617	626	---	596	637	467	600	611	553			
Jacksonville, Fla.	6	5:55P	65	607	347	427	427	487	547	616	607	636	---	586	637	447	590	611	542			
Savannah, Ga.	6	11:00P	59	607	357	427	427	477	547	606	607	636	---	586	627	444	587	611	539			
Florence, S. C.	7	6:15A	50	587	337	397	417	467	537	586	587	636	---	576	617	427	570	606	525			
Reiced at Florence																						
Rocky Mount, N. C.	7	1:10P	75	577	337	447	407	447	---	586	577	636	---	556	617	434	582	596	522			
Richmond, Va.	7	4:50P	75	577	337	387	407	447	---	586	577	636	---	546	617	414	582	591	512			
Potomac Yards, Va.	7	10:10P	56	577	347	387	407	447	---	571	567	631	---	541	607	414	569	586	507			
Potomac Yards, Va.	8	12:00N	59	537	337	367	392	422	---	551	532	606	---	496	592	394	542	551	481			
Sunnyside, N. J.	9	12:55P	64	537	337	347	377	407	---	516	502	586	---	476	562	377	509	531	459			

Table 19

TEMPERATURES DURING PRECOOLING

210 4/5-bushel boxes and
423 1-3/5-bushel boxes
Billing Weight - 48999

WITH ICE AND PORTABLE ELECTRIC MOTORS AND PRECO FANS

CAR I

ON FGE 56279

April 5, 1951-I
Winter Garden, Florida

Time	OST	Top Air	Bot Air	EB CL	BQ CL	BD CL	MB CL	MQ CL	MD CL	TB CL	TQ CL	TD CL	TXQ CL	Bot Avg	Mid Avg	Top Avg	Grand Avg
6:15P	71	735	395	505	660	685	630	725	712	680	730	700	730	617	689	703	670
7:25P	67	495	555	545	670	685	650	705	692	690	680	640	740	633	682	670	662
8:25P	64	485	555	565	670	675	640	695	662	680	620	595	700	637	666	632	645
9:25P	62	465	635	555	660	655	620	665	632	650	580	560	660	623	639	597	620
10:25P	60	475	645	585	680	665	620	685	622	650	560	550	650	643	642	587	624
11:25P	56	475	645	595	680	665	630	685	612	650	550	540	660	647	642	580	623
12:25A	54	495	635	600	680	655	620	685	602	640	530	530	600	645	636	567	616

COMPARISON OF ICING SERVICES

Std. Refrig. (4 cars)

Avg. Minimum —
 Avg. Maximum —●—
 Item 80, Sec. 2 (6 cars)
 Avg. Minimum — — —
 Avg. Maximum X — X — X

A

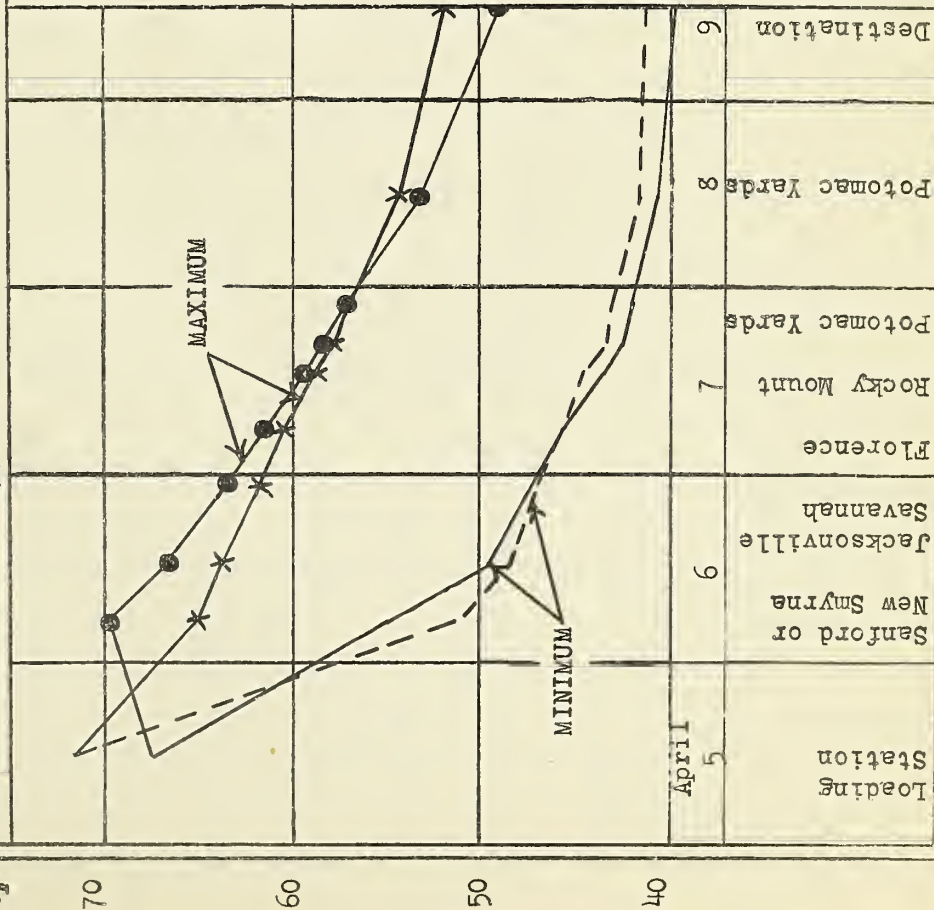


Figure 1

CONSOLIDATED FRUIT TEMPERATURES

COMPARISON OF ICING SERVICES

AND OF TYPES OF CARS

COMPARISON OF TYPES OF CARS
 Non-Fan Service (7 cars)
 Avg. Minimum —
 Avg. Maximum —●—
 Fan Service (3 cars)
 Avg. Minimum — — —
 Avg. Maximum X — X — X

B

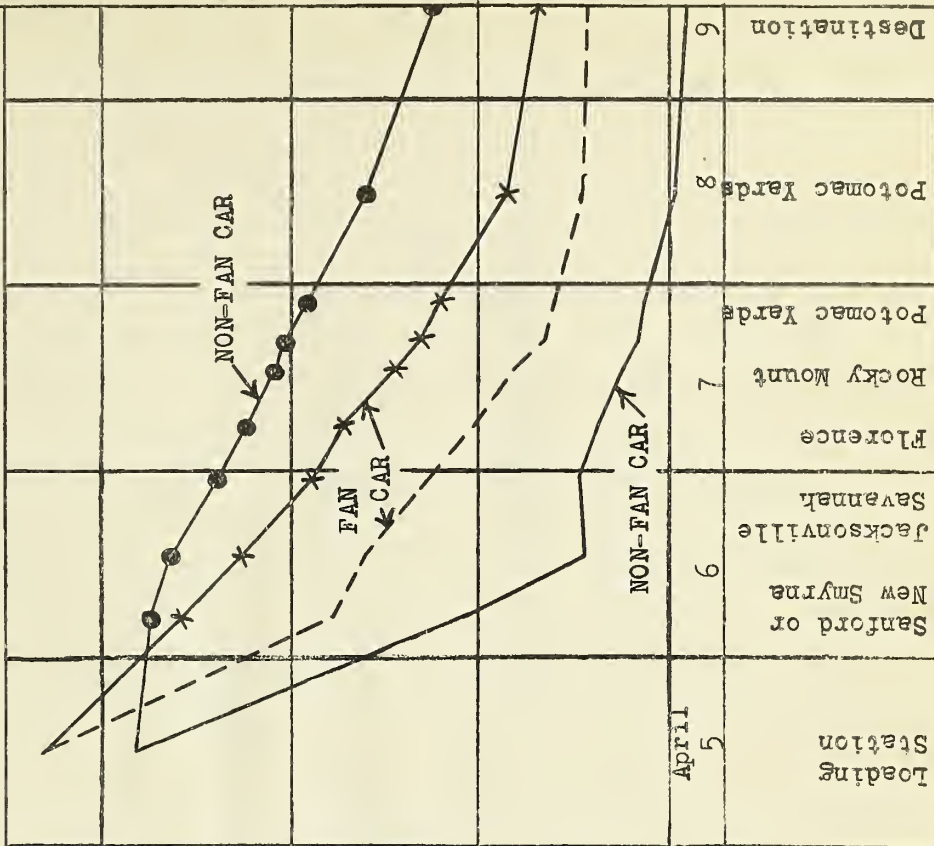


Figure 2

CAR A ORANGES (April 1951) 526 BOXES
PRECOOLED IN ROOM
PREICED, FANS ON
ITEM 80, SECTION 2
REICED AT FLORENCE

FRUIT TEMPERATURES

Avg. Top *
Avg. Mid *
Avg. Bot - - -
- - -
- - -

CAR B ORANGES (April 1951) 526 BOXES
PRECOOLED IN ROOM
PREICED, FANS ON
STANDARD REFRIGERATION

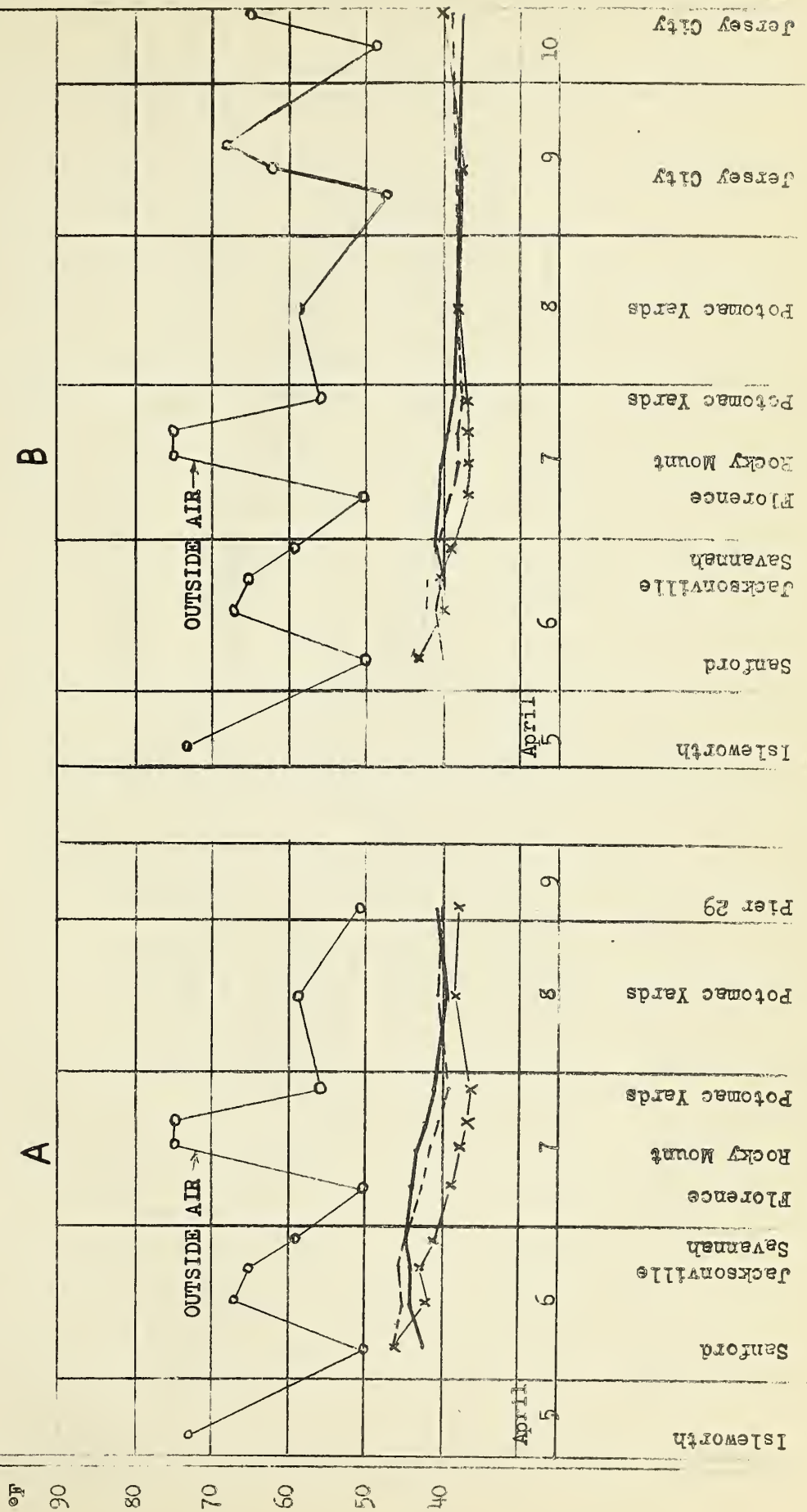


Figure 4

CAR E ORANGES & GF (April 1951) 525 BOXES
STAGE ICING PREICED, FANS ON
STANDARD REFRIGERATION

AVG. Top X
AVG. Mid ---
AVG. Bot —

F₀

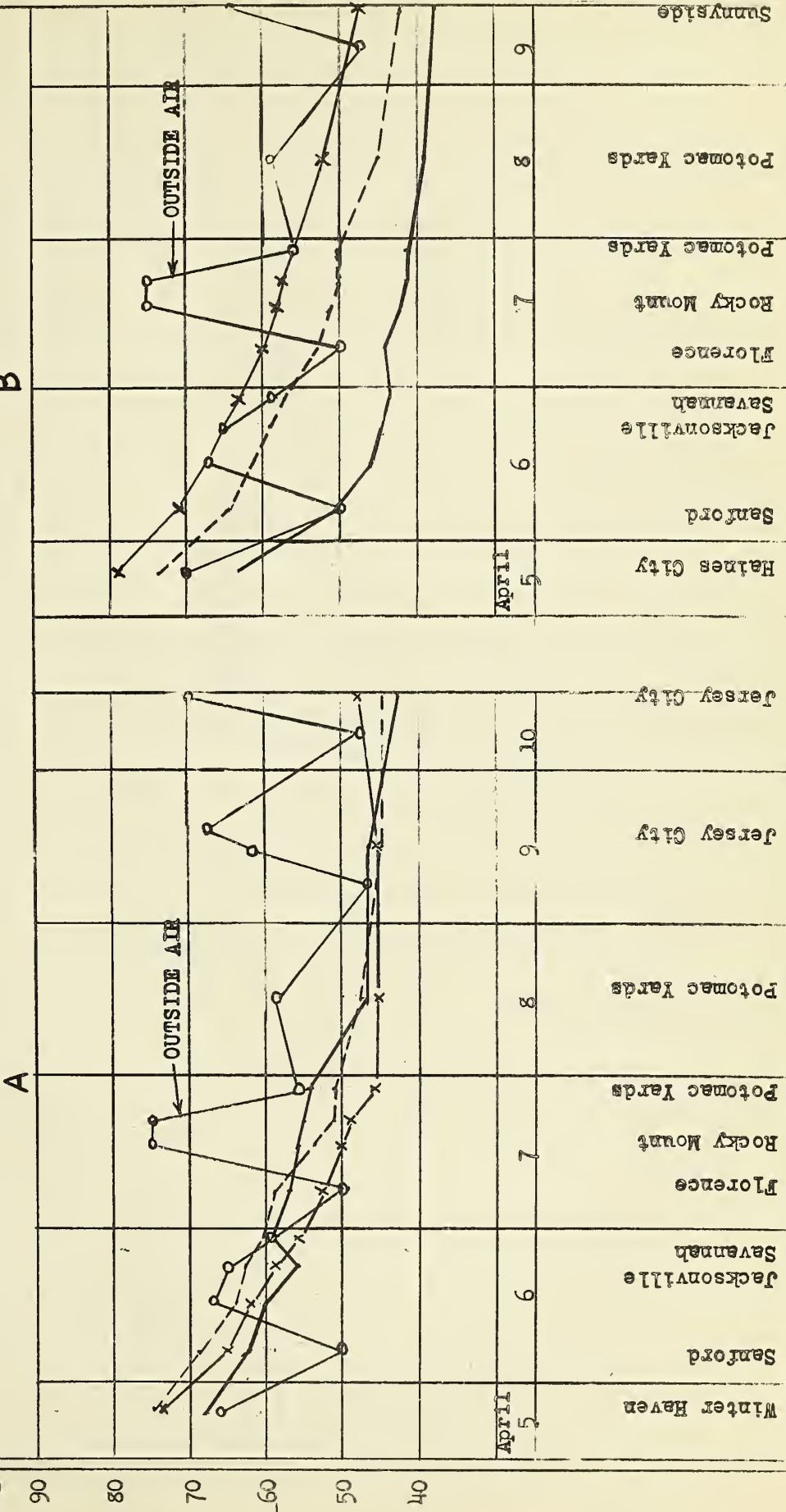


Figure 5

CAR G GRAPEFRUIT (April 1951) 493 BOXES
INITIALLY ICED AFTER LOADING
ITEM 80, SECTION 2
REFICED AT FLORENCE
NON-FAN

FRUIT TEMPERATURES

AVG. Top X
AVG. Mid X
AVG. Bot ---
NON-FAN

° F

A

B

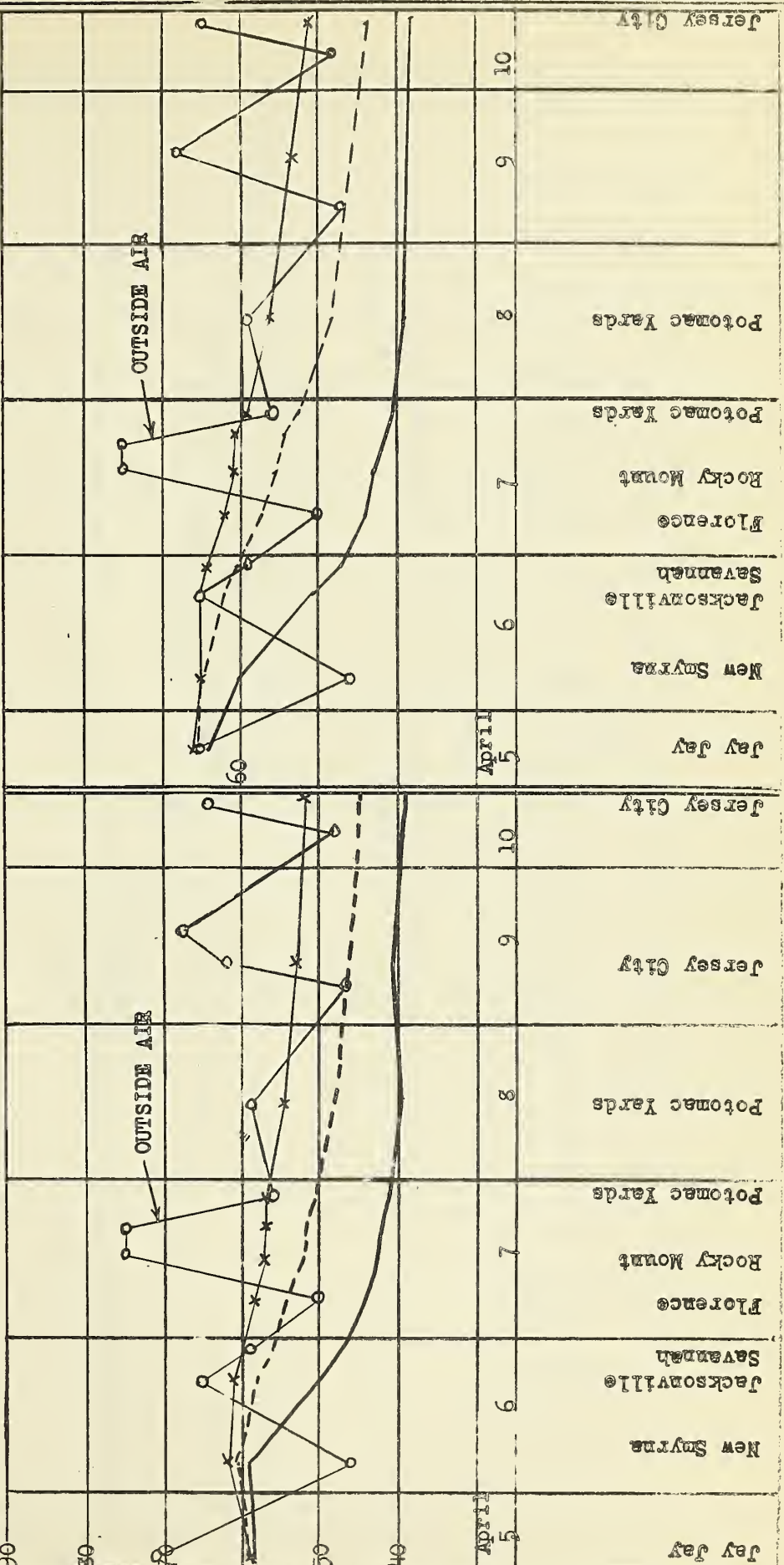


Figure 6

FRUIT TEMPERATURES
 Avg. Top O—O—O
 Avg. Mid - - -
 Avg. Bot ———

Commodity and Air Temperatures
 In Precooling Test with Preco Fans
 Bunkers Preiced

CAR 1 ORANGES IN
 210 4/5-BUSHEL BOXES AND
 423 1-3/5-BUSHEL BOXES
 BILLING WEIGHT - 48999
 FAN CAR

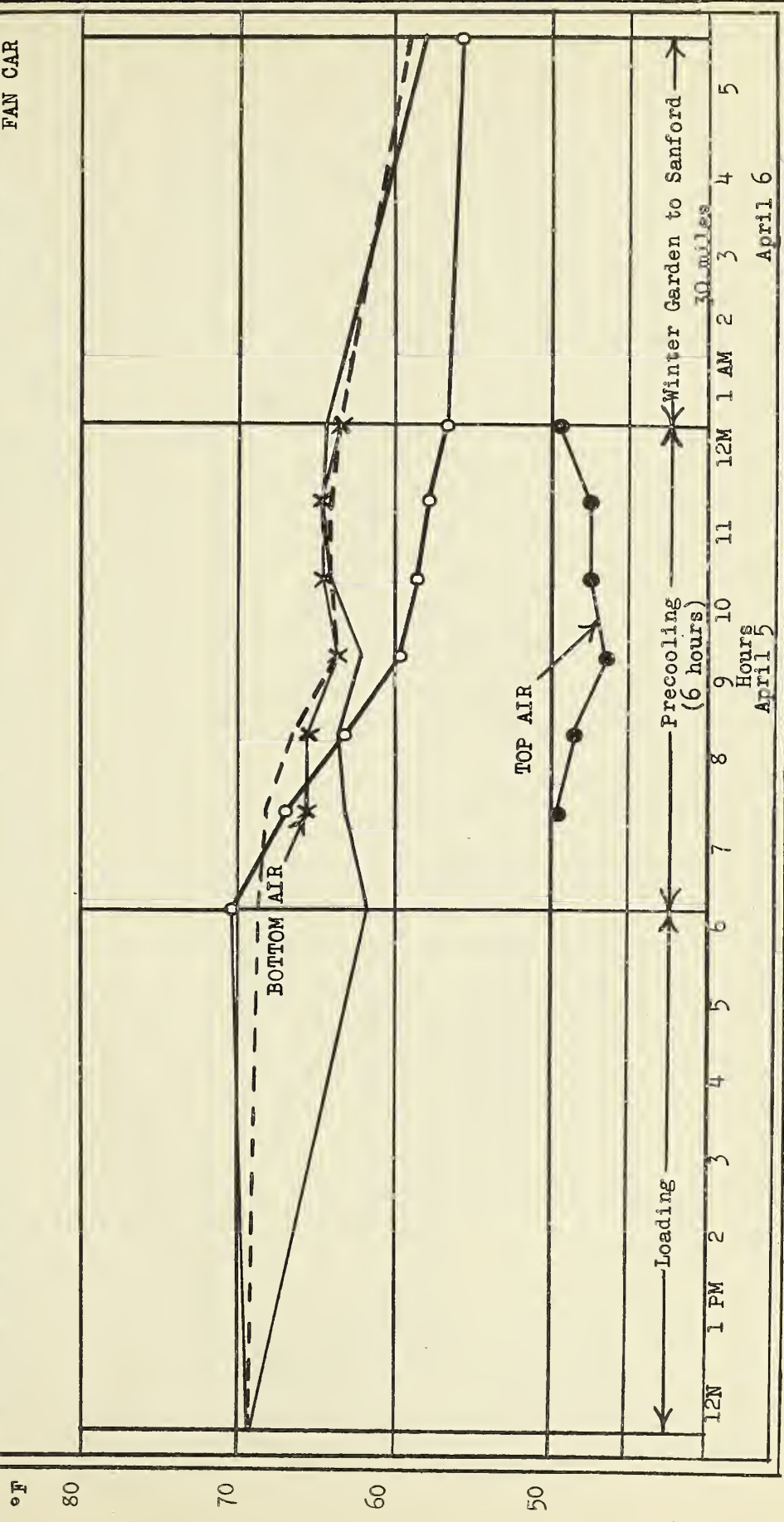


Figure 7

CAR J ORANGES & GF (April 1951)
4000 8-LB. VENT VIEW KRAFT BAGS
OVER 105 BOXES NON-FAN
PREICED ITEM 80, SECTION 2,
REICED AT FLORENCE

FRUIT TEMPERATURES

Avg. Top —*—*—
Avg. Mid - - - - -
Avg. Bot _____

CAR I ORANGES & TEMPLES (April 1951)
528 BOXES PREICED, PRECOOLED WITH
PRECO FANS ITEM 80, SECTION 2,
FANS ON REICED AT JACKSONVILLE

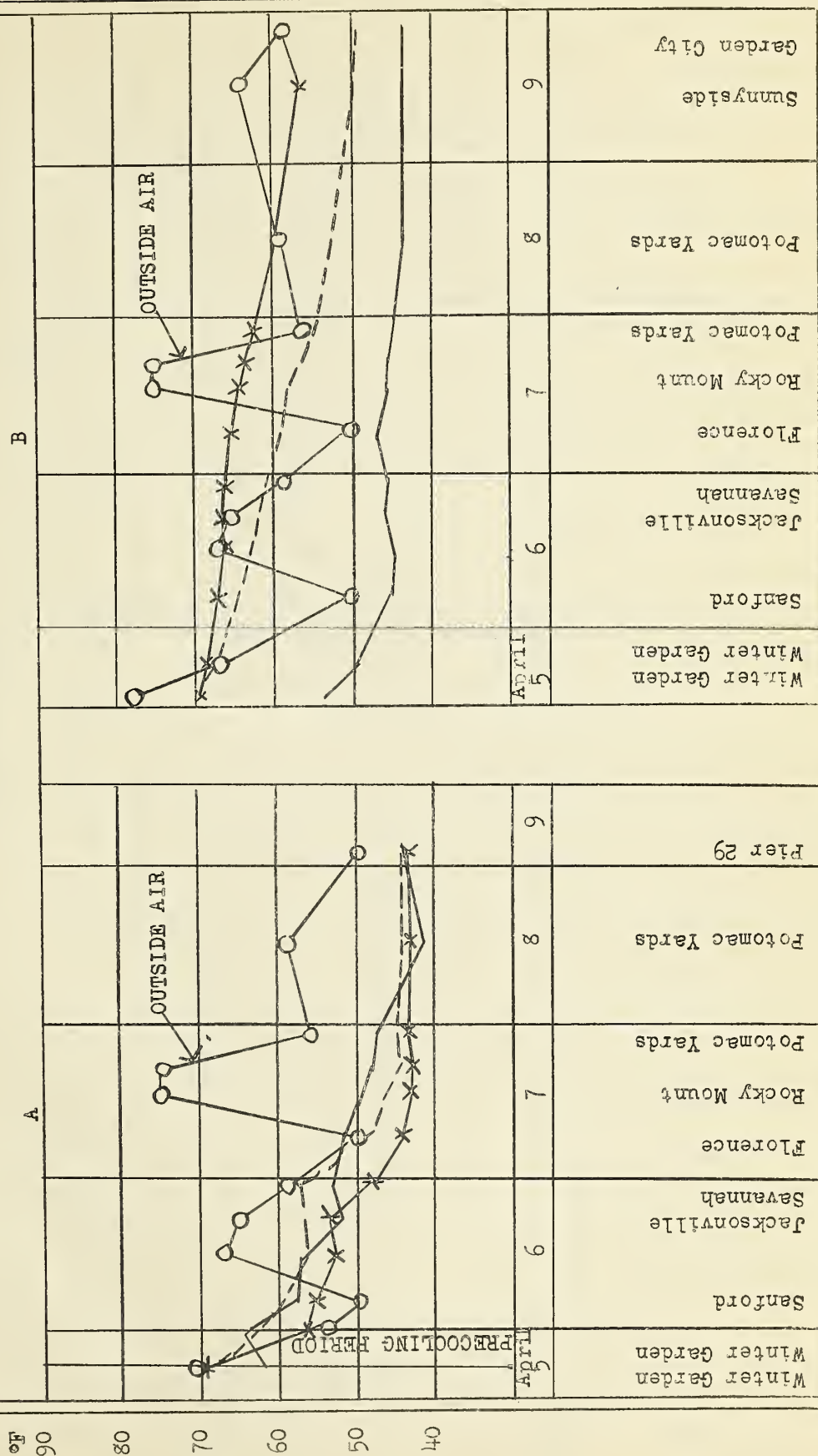


Figure 8

CAR K ORANGES (April 1951)
4590 8LB. VENT VIEW KRAFT BAGS
PREICED, FANS ON
RULE 251
REICED AT FLORENCE

FRUIT TEMPERATURES

Avg. Top \times — \times — \times —
 Avg. Mid — — — — —
 Avg. Bot — — — — —

DOUBLE-DECK CARS

०८

A

